

6.0 Grand Junction, Colorado, Disposal Site

6.1 Compliance Summary

The Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, was inspected on March 21 and 26, 2008. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. A portion of the disposal cell remains open and is operated by DOE to receive additional low-level radioactive waste materials from various sources. The annual inspection requirement is only applicable to the closed and completed portion of the disposal cell and the surrounding disposal site.

DOE is evaluating relatively low-cost methods for renovating conventional (low-permeability) covers at the site. Groundwater monitoring was performed as a best management practice; trends continue. Maintenance performed in 2008 included repairing a portion of a drainage ditch, replacing broken and missing perimeter signs, cutting and treating tamarisk, and removing sediment accumulations from the east storm water collection pond. No other maintenance needs or cause for a follow-up inspection were identified.

6.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Grand Junction Disposal Site are specified in the *Interim Long-Term Surveillance Plan [LTSP] for the Cheney Disposal Site Near Grand Junction, Colorado* (DOE/AL/62350–243, Rev. 1, U.S. Department of Energy [DOE], Albuquerque Operations Office, April 1998) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 6–1.

Table 6–1. License Requirements for the Grand Junction Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 6.3.1
Follow-Up or Contingency Inspections	Section 3.0	Section 6.3.2
Routine Maintenance and Repairs	Sections 2.7.3 and 4.0	Section 6.3.3
Groundwater Monitoring	Section 2.6	Section 6.3.4
Corrective Action	Section 5.0	Section 6.3.5

Institutional Controls—Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs placed along the property boundary, and a locked gate at the entrance to the site access road.

The United States of America owns the 360-acre disposal site. DOE will operate the disposal site until final closure. Only closed and completed parts of the disposal cell and the area surrounding the disposal site are addressed during the annual inspection. Approximately 21 acres in the center of the disposal cell are active to receive residual radioactive material (RRM) and other authorized radioactive waste. The active area, the temporary structures associated with its operation, and the

temporary contaminated material stockpile areas are not part of the annual inspection except as they may affect the long-term safety and performance of the closed portion of the disposal cell.

Inspectors found no evidence that these institutional controls were ineffective or violated.

6.3 Compliance Review

6.3.1 Annual Inspection and Report

The site, located south of Grand Junction, Colorado, was inspected on March 21 and 26, 2008. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 6–1. Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

Weekly environmental and security inspections of the entire site are performed to verify that the site is secure, and radon is monitored continuously to ensure that the open portion of the cell is protective of human health and the environment. This portion of the disposal cell is scheduled to remain open until 2023, or until filled to its design capacity, at which time it will be closed in accordance with design criteria. Upon concurrence in the final closure of the open portion of the cell and the final version of the LTSP, the site will be accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27). DOE will then become the licensee and, in accordance with the requirements for UMTRCA Title I sites, will be responsible for the custody and long-term care of the site. The open and active portion of the disposal cell within the closed but unlicensed portion of the disposal cell makes the Grand Junction Disposal Site unique among the 19 UMTRCA Title I disposal sites.

6.3.1.1 Specific Site-Surveillance Features

Site Access Gate, Access Road, Entrance Gate, and Fence—Access to the site is controlled by two double swing stock gates, one in the U.S. Highway 50 right-of-way fence and a second 1.7 miles east at the site entrance. The DOE locks, chains, and gates were in excellent condition.

A paved all-weather access road extends approximately 1.7 miles east from U.S. Highway 50 along DOE’s perpetual right-of-way across federal land administered by the U.S. Bureau of Land Management (BLM). No erosion problems were observed along the access road. The fence along the right-of-way corridor is secure and in excellent condition.

Entrance and Perimeter Signs—An entrance sign is located at the entrance gate, and 29 perimeter signs are located at regular intervals along the DOE property boundary. The signs are installed on galvanized steel posts set in concrete. Perimeter sign P17 was broken in half and replaced. Perimeter sign P27 was missing and replaced. Several signs are slightly bent or warped but are legible. All other signs are in excellent condition. The base of perimeter sign P24 had been slightly displaced when hit by road-grading equipment, but it is stable.

Additional warning signs are posted on the wire perimeter fence and are associated with the operation of the open cell. Metal controlled-area signs and yellow plastic no-trespassing signs are secured to the fence in pairs. There are 75 warning sign locations, each about 200 feet apart along the site boundary.

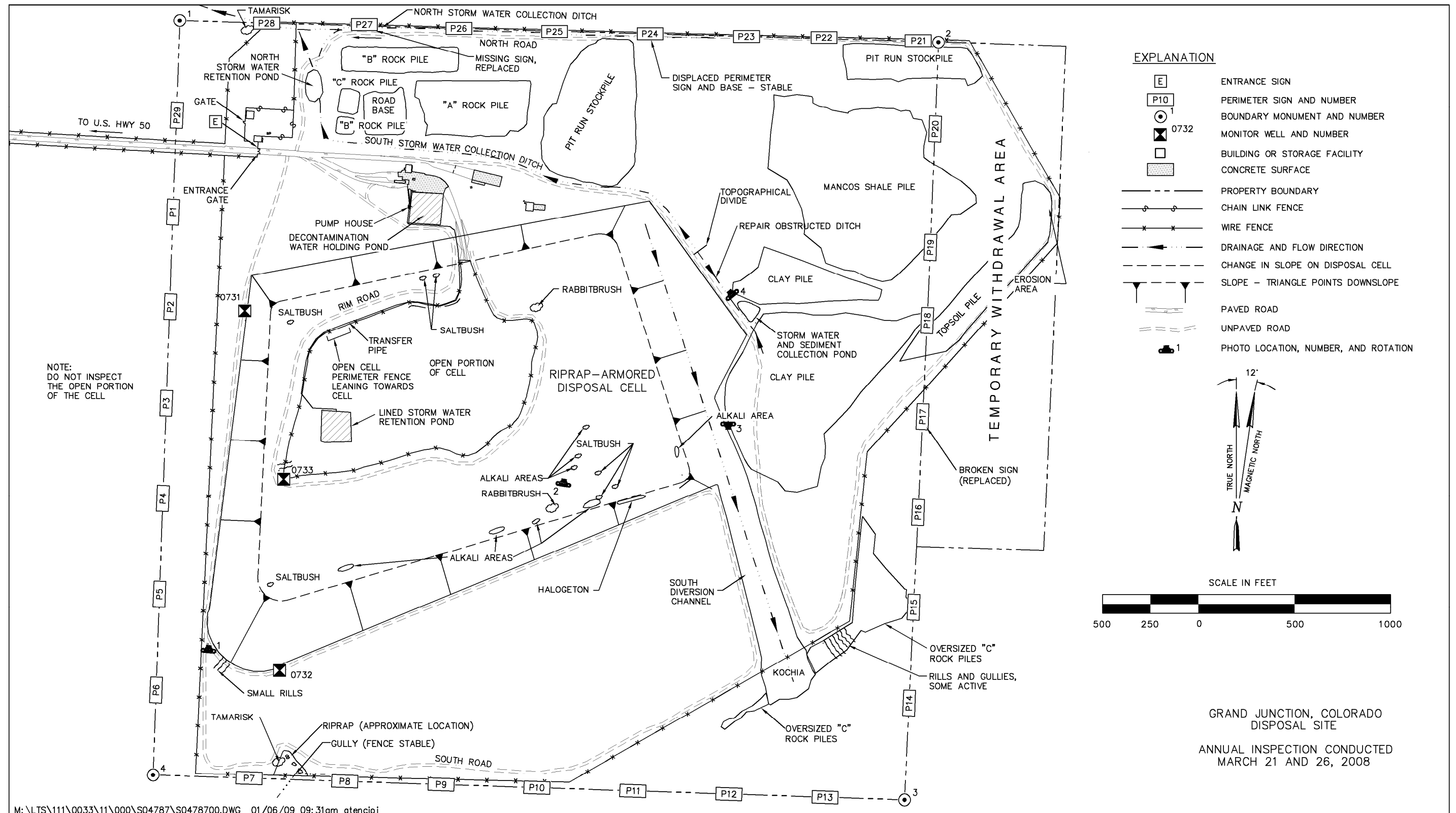


Figure 6-1. 2008 Annual Compliance Drawing for the Grand Junction Disposal Site

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Site Markers and Boundary Monuments—Granite site markers similar to those installed at other sites will not be installed at this site until the disposal cell is closed.

The site has four permanent boundary monuments, one at each of the four corners. The monuments mark the exact location of the site corners. All were in excellent condition.

Monitor Wells—The groundwater monitoring network consists of three monitor wells. All three wells are inside the site boundary. The wells were secure and in excellent condition.

6.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into five transects: (1) the closed portion of the disposal cell, (2) the diversion structures and drainage channels, (3) the area between the disposal cell and the site boundary, (4) the site perimeter, and (5) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, slumping, or other phenomena that might affect the site's integrity or long-term performance.

Closed Portion of the Disposal Cell—The top and side slopes of the disposal cell are covered with basalt riprap. The rock is durable and in excellent condition. There is no evidence of slope instability, and very little plant encroachment is occurring on the side slopes (PL-1).

Runoff drains toward the southeast corner of the cell. Several small areas with evaporite deposits are present on the cover near the southeast corner (PL-2). There was no evidence of settling or erosion of the cell cover, so these features are not a concern.

Grasses and weeds grow on most of the cell cover, and scattered deep-rooted vegetation (primarily shrubs) has been persistent on the cover. The grasses and weeds have shallow root systems and do not degrade cell cover performance. The deep-rooted shrubs could pose a threat to the long-term integrity of the radon barrier and are periodically removed or treated with herbicide.

- 6B** In 2007, DOE constructed a test facility at the site to evaluate relatively low-cost methods for renovating conventional (low-permeability) compacted soil layer (CSL) to evapotranspiration covers. The study, the Renovated Evapotranspiration Cover Assessment Project (RECAP), consists of two swimming-pool-size drainage lysimeters designed for large-scale testing of cover performance.

DOE believes that cover renovation may lead to reduced risk and cost over the long term. Research by DOE and U.S. Environmental Protection Agency (EPA) has shown that permeability and percolation in conventional CSL covers, as monitored *in situ* after construction, are often 100 to 1,000 times greater than the design target. In contrast, percolation in alternative covers that rely on thick soil layers and plant evapotranspiration to store and remove precipitation

is often 10 to 100 times less than design targets. Furthermore, the cost of vegetation management on conventional covers increases as plant habitat develops naturally over time.

Plants may be the solution, not the problem. The RECAP facility, constructed adjacent to the disposal cell, will compare the performance of the existing CSL cover design with a renovated evapotranspiration cover design. The test covers in both lysimeters were constructed to match, as close as possible, the materials and design criteria used for the existing disposal cell cover. After several months of baseline monitoring, DOE will plant one of the two test covers and then continue comparing their performance. DOE plans to weigh the results of the study in future long-term surveillance and maintenance decisions.

Diversion Structures and Drainage Channels—The south diversion channel is a large riprap-armored structure that conveys runoff water from the disposal cell southeast into a natural drainage that flows away from the site to the southwest. The diversion channel is in excellent condition. Some plant growth, including grasses, weeds, and deep-rooted shrubs, exists within the channel (PL-3). However, there is not enough growth to impede water flow within the channel. Erosional features at the outfall of the channel are self-armoring with large riprap boulders and are stable. An area of active erosion east of the outfall area continues to be monitored, but no surveillance features are threatened, and the area is expected to stabilize.

6C Other drainage features at the site include north and south storm water collection ditches, the north storm water retention pond, and a storm water and sediment collection pond on the east side of the south diversion channel. These small drainage features control storm water runoff primarily from the various cover materials stockpiled on the northern and eastern portions of the disposal site property. The north storm water collection ditch also captures run-on storm water from a large catchment area north and east of the disposal site. The south storm water collection ditch was filled in at one location when access to the clay stockpile was needed. In 2008, this location on the ditch was repaired to restore its drainage function (PL-4). Accumulated sediment was also removed from the storm water and sediment collection pond. The ditches and ponds are functioning as designed.

Area Between the Disposal Cell and the Site Boundary—There are 12 discrete stockpiles of rock and soil between the disposal cell and the site boundary on the north and east sides of the disposal cell. These materials eventually will be used to cover and close the open cell. Natural vegetation is generally well established and is protecting the stockpiles from significant erosion.

On the south and west sides of the disposal site, between the disposal cell and the perimeter fence, the ground is relatively flat and covered with native vegetation that consists primarily of perennial grasses and small shrubs. No erosion was observed in the undisturbed areas south and west of the disposal cell.

6D Tamarisk, a deep-rooted, water-depleting noxious plant, continues to be reestablished at several locations on the site but is being actively managed through periodic cutting and spraying with herbicide. These efforts have significantly reduced the tamarisk population at the site.

Site Perimeter—The perimeter fence surrounding the site consists of a combination of square wire mesh at the bottom and two strands of barbed wire along the top, both supported by steel T-posts. The fence is in good condition, and there was no evidence of livestock entering the enclosed area.

The fence is set along or near the property line on the north and south sides of the site, about 250 feet inside the property line on the west, and as much as 1,000 feet inside at the southeast corner of the site. On the east side, the fence extends beyond the site boundary to enclose part of an adjoining 40-acre temporary withdrawal area that is federal land administered by BLM. The temporary withdrawal area is not included in the interim LTSP and, therefore, is not formally inspected. DOE uses the temporary withdrawal area to stockpile cover materials for the eventual closure of the open portion of the cell.

A gully has developed along the south perimeter fence (near perimeter sign P8) on the fringe of a riprap-armored drainage area. The gully is encroaching on the fence line; however, the fence and posts were taut and secure at the time of the inspection.

Outlying Area—The area outward from the disposal site for a distance of 0.25 mile was visually inspected. No development or disturbance that could affect the disposal site was observed. Most of the land surrounding the site is rangeland administered by BLM. The land is covered by native grass and shrubs, and is used primarily for cattle grazing.

6.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2008.

6.3.3 Routine Maintenance and Repairs

In 2008, DOE performed the following maintenance at the site: A portion of the south storm water collection ditch was repaired to restore its drainage function. Accumulated sediment was removed from the storm water and sediment collection pond. Tamarisk was cut and treated with herbicide. Perimeter signs P17 and P27 were replaced.

6.3.4 Groundwater Monitoring

6E Monitoring of groundwater in the uppermost aquifer (Dakota Sandstone) beneath the disposal site is not required because narrative supplemental standards apply (40 CFR Part 192.21 [g]). The basis for supplemental standards is that the groundwater is designated of “limited use” because the total dissolved solids (TDS) content exceeds 10,000 milligrams per liter (mg/L) (40 CFR Part 192.11 [e]). Confined groundwater in the uppermost aquifer lies approximately 750 feet below the existing ground surface and is hydrogeologically isolated from the tailings material by mudstones and shales of the Mancos Shale.

In lieu of monitoring groundwater in the uppermost aquifer, DOE voluntarily monitors groundwater as a best management practice from two monitor wells completed in (or very near) buried alluvial paleochannels adjacent to the disposal cell (MW-0731 and MW-0732) and one monitor well in the disposal cell (MW-0733) (Table 6-2). This best-management-practice monitoring is performed to assess the performance of the disposal cell and to ensure that any groundwater in the paleochannels is not being impacted by seepage (transient drainage) from the disposal cell. The paleochannel wells are along the west (downgradient) edge of the disposal cell and are screened at the interface between the alluvium and shallow Mancos Shale. The third well is in the southwest corner of the open portion of the disposal cell and is used primarily for the measurement of water levels in the deepest part of the disposal cell to demonstrate that the groundwater elevation directly beneath the cell has not risen high enough to move laterally into the paleochannels.

Table 6-2. Groundwater Monitoring Network at the Grand Junction Disposal Site

Monitor Well	Hydrologic Relationship
MW-0731	Paleochannel, downgradient, edge of cell, north side
MW-0732	Paleochannel, downgradient, edge of cell, south side
MW-0733	Disposal cell, deepest location, downgradient, center

Groundwater Level Monitoring—Static water-level measurements are obtained from each well prior to the collection of water quality samples (Figure 6-2). In September 2006, dataloggers were installed in each well to obtain continuous water-level measurements (4-hour interval).

The water level in the disposal cell well MW-0733 has displayed a persistent rise of approximately 2.5 feet since 1998. Since 1998, the water level in the disposal cell well MW-0733 has remained significantly deeper than water levels in the two paleochannels wells MW-0731 and MW-0732 (Figure 6-2). Water levels within the two paleochannels at wells MW-0731 and MW-0732 have displayed a decrease of approximately 3 to 4 feet since 1998; although, this decrease is more varied and larger than which has occurred in well MW-0733. In 2008, water levels in these wells MW-0731 and MW-0732 continued the downward trend. Based on this information, there currently is no potential for groundwater at the base of the disposal cell at well MW-0733 to migrate to the paleochannels at wells MW-0731 and MW-0732.

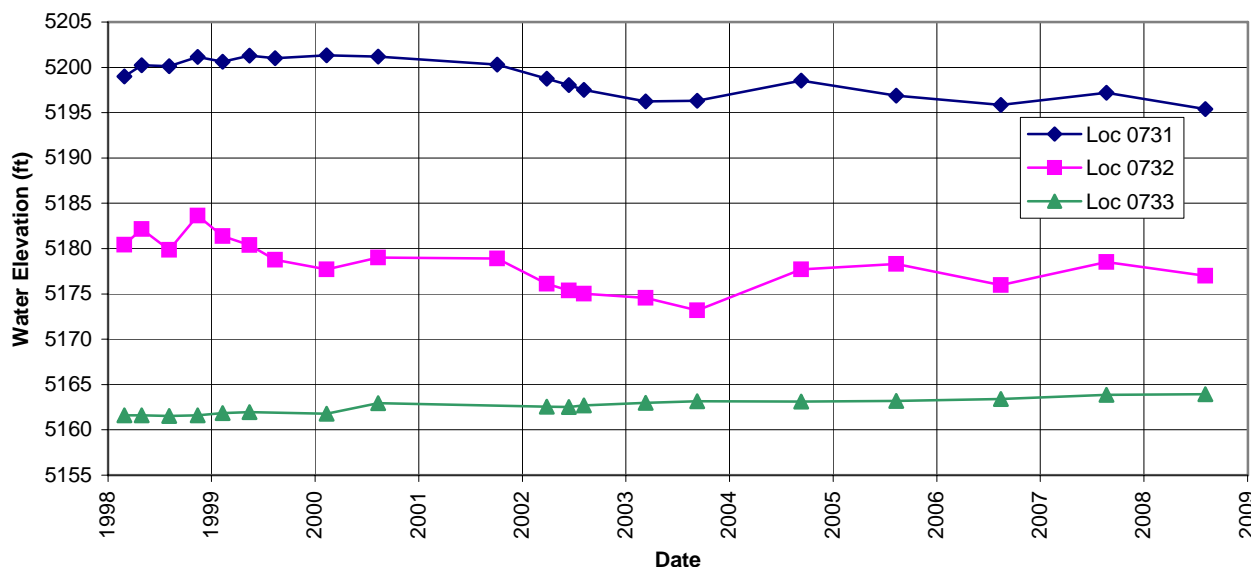


Figure 6–2. Water-Level Measurements at the Grand Junction Disposal Site

Groundwater Quality Monitoring—Groundwater samples are analyzed for standard field parameters and the following indicator analytes: molybdenum, nitrate, selenium, sulfate, TDS, uranium, vanadium, and polychlorinated biphenyls. Key indicator analytes are molybdenum, nitrate, selenium, and uranium. At 40 CFR 192, Subpart A, Table 1, the EPA has established maximum concentration limits (MCLs) for these analytes in groundwater (Table 6–3). Time-concentration plots, from 1998 through 2008, for three key indicator analytes—nitrate (as nitrogen), selenium, and uranium—are shown on Figures 6–3 through 6–5.

Table 6–3. Maximum Concentration Limits for Groundwater at the Grand Junction Disposal Site

Constituent	MCL ^a (mg/L)
Molybdenum	0.1
Nitrate (as Nitrogen)	10
Selenium	0.01
Uranium	0.044

^aEPA MCLs as listed in 40 CFR 192, Subpart A, Table 1.

MCL = maximum concentration limit.

mg/L = milligrams per liter.

Nitrate (as nitrogen) concentrations in groundwater continued to exceed the MCL of 10 mg/L in the paleochannel monitor wells (MW–0731 and MW–0732) through 2008 (Figure 6–3).

Concentrations in well MW–0731, following an initial steep downward trend, remained below the MCL from 2000 through 2004. In 2005, and continuing through 2008, concentrations were steadily increasing above the MCL. Concentrations in well MW–0732, although varied, have

consistently remained above the MCL since 1998. Concentrations in well MW-0733 continued a significant downward trend, dropping below the MCL in 2006, and reaching a historical low of 7.8 mg/L in 2008. Historically, the highest concentration of nitrate (96 mg/L) occurred in 1998 from the disposal cell well MW-0733. In 2008, the highest concentration of nitrate, 36 mg/L, occurred in paleochannel well MW-0732.

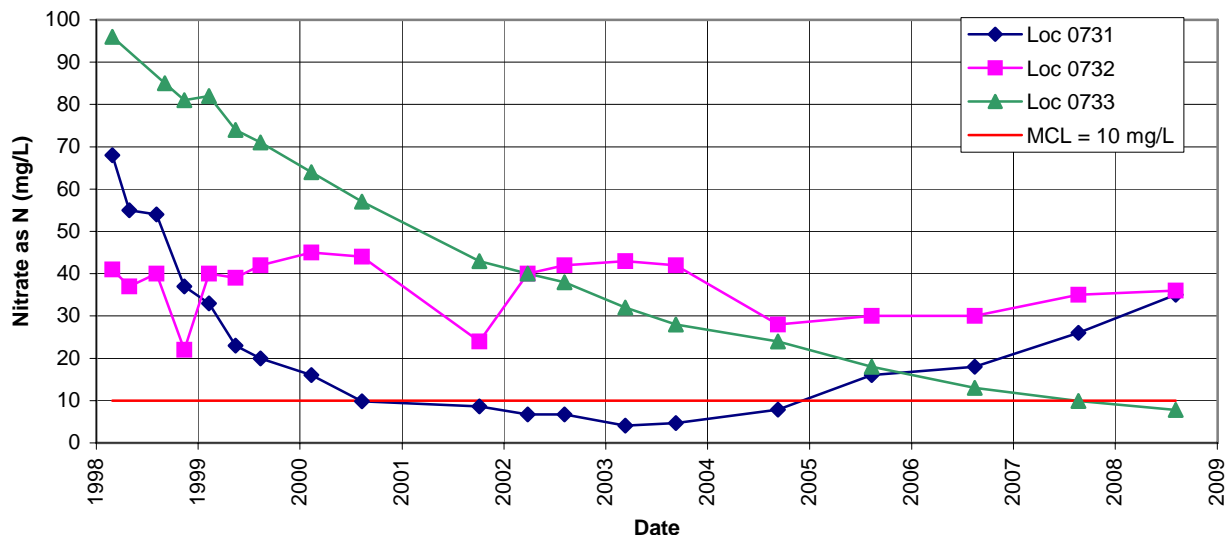


Figure 6-3. Time-Concentration Plots of Nitrate (as Nitrogen) in Groundwater at the Grand Junction Disposal Site

Selenium occurs naturally in the Mancos Shale deposits that underlie the disposal cell and may be the cause of the elevated concentrations reported in both paleochannel monitor wells MW-0731 and MW-0732. Selenium concentrations continued to exceed the MCL of 0.01 mg/L in the paleochannel wells (Figure 6-4). Concentrations in well MW-0731 displayed a sharp decreasing trend, with the decreasing trend continuing until 2003, at which time a slight upward trend began. In 2008, concentrations in well MW-0731 continued to increase (approximately 0.1 mg/L). Concentrations in well MW-0732, although more variable than wells MW-0731 and MW-0733, continue to display no trend. In well MW-0733, the selenium concentration of 0.0025 mg/L remained well below the standard, with no trend evident. In 2008, the highest concentration of selenium, 0.59 mg/L, occurred in paleochannel well MW-0731.

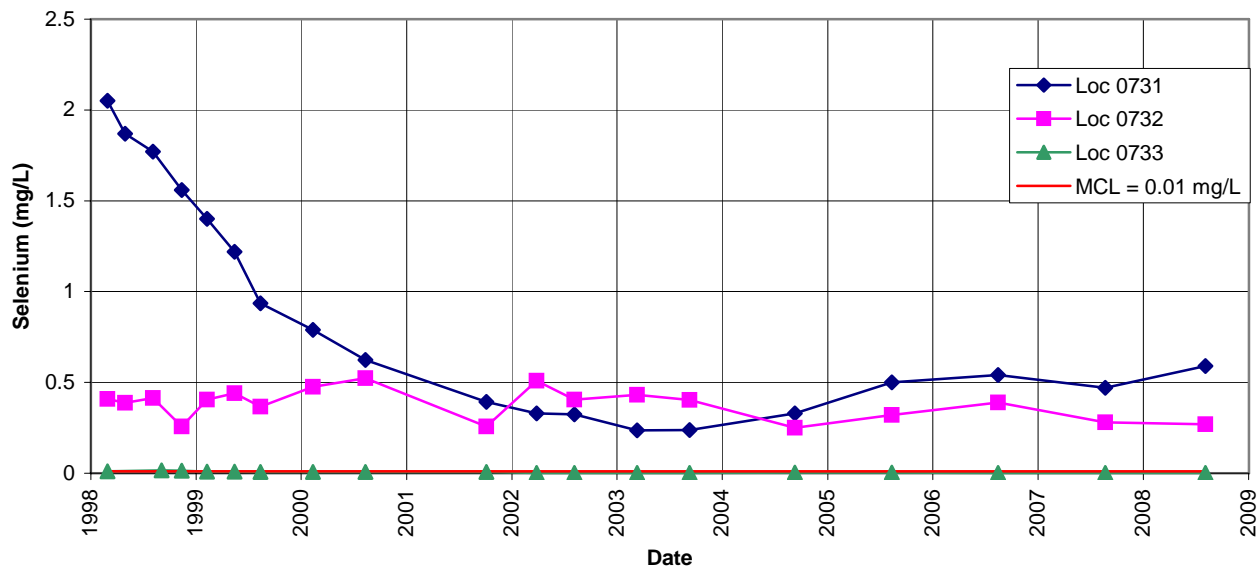


Figure 6-4. Time-Concentration Plots of Selenium in Groundwater at the Grand Junction Disposal Site

Uranium concentrations in groundwater were below the MCL of 0.044 mg/L in samples from the two paleochannel wells MW-0731 and MW-0732, but were reported above the MCL in well MW-0733 (0.065 mg/L) for the second consecutive time (Figure 6-5). Concentrations in well MW-0731, after an initial increase, have displayed a decreasing trend that continued in 2008. Concentrations in wells MW-0732 and MW-0733 remained relatively consistent through 2003, at which time an upward trend began in both wells, which continues to be much more pronounced in well MW-0733.

The elevated uranium in MW-0733 pose no risk to human health or the environment because the disposal cell is situated on a thick aquiclude overlying limited use groundwater that is not for any purpose.

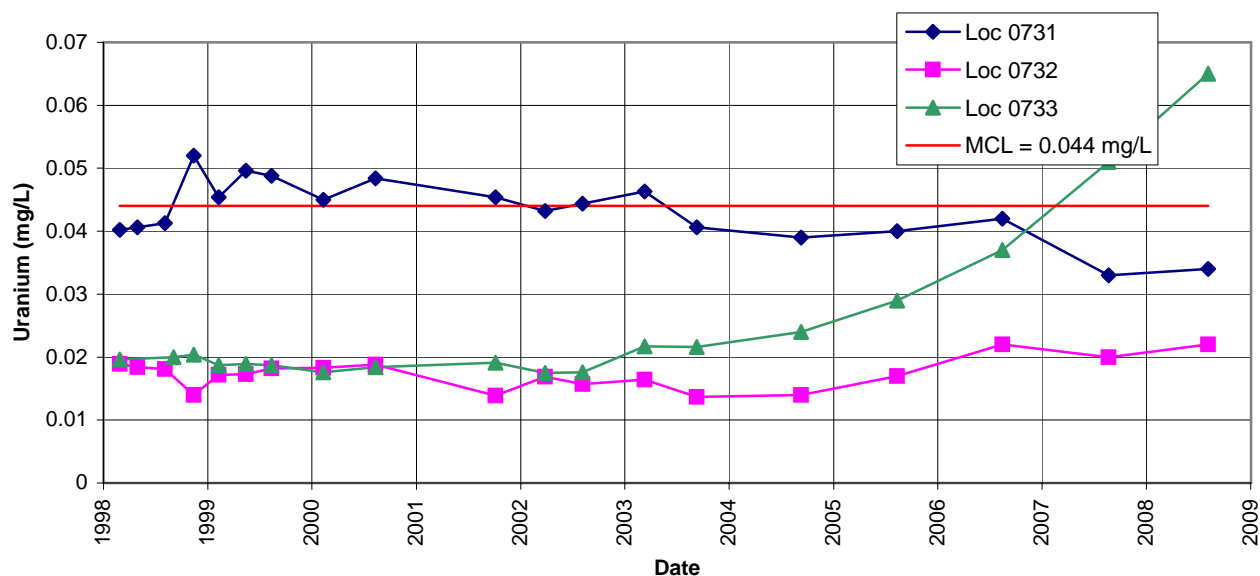


Figure 6–5. Time-Concentration Plots of Uranium in Groundwater at the Grand Junction Disposal Site

6.3.5 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2008.

6.3.6 Photographs

Table 6–4. Photographs Taken at the Grand Junction Disposal Site

Photograph Location Number	Azimuth	Photograph Description
PL–1	5	View north along the west side slopes of the disposal cell.
PL–2	10	Alkali area near the southeast corner of the disposal cell top.
PL–3	180	View down slope along the south diversion channel.
PL–4	320	Storm water drainage ditch between the south diversion channel and the clay stockpile.



GRJ 3/2008. PL-1. View north along the west side slope of the disposal cell.



GRJ 3/2008. PL-2. Alkali area near the southeast corner of the disposal cell top.



GRJ 3/2008. PL-3. View down slope along the south diversion channel.



GRJ 3/2008. PL-4. Storm water drainage ditch between the south diversion channel and the clay stockpile.